DOE's
Small Business Innovation Research (SBIR) and Small Business Technology TRansfer (STTR) Programs

Manny Oliver
Director, DOE SBIR/STTR Programs Office

Advanced Scientific Computing Advisory Committee
September 26, 2017
Arlington, VA

Outline

- Overview of the DOE SBIR/STTR Programs

- Recent Operational Changes

  – Phase 0 Program

  – Streamlining the Application and Award Process

  – Sequential Phase II Awards

  – ASCR SBIR/STTR Research Topic Innovations

- Assessment of the DOE SBIR/STTR Programs

OVERVIEW OF THE DOE SBIR/STTR PROGRAMS

Program Goals

Small Business Innovation Research (SBIR) *est. 1982*

- Stimulate technological innovation

- Use small business to meet Federal R&D needs

- foster and encourage participation by socially and economically disadvantaged small businesses (SDBs), and by woman-owned small businesses (WOSBs), in technological innovation

- Increase private-sector commercialization of innovations derived from Federal R&D

**Small Business Technology Transfer (STTR)** *est. 1992*

- Stimulate and foster scientific and technological innovation through cooperative research and development carried out between small business concerns and research institutions

- Foster technology transfer between small business concerns and research institutions

SBIR and STTR were reauthorized on December 23, 2016 (P.L. 114-840) through September 30, 2022

SBIR & STTR Funding Levels

- Agencies allocate a percentage of their extramural R/R&D budgets for the SBIR & STTR programs
  - SBIR: 3.2% (FY 2018), for agencies with >$100M in extramural R/R&D
  - STTR: 0.45% (FY 2018), for agencies with >$1B in extramural R/R&D
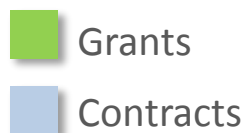- Congress has increased the allocation percentages since the programs were initiated

OBLIGATIONS*

ALLOCATION PERCENTAGE
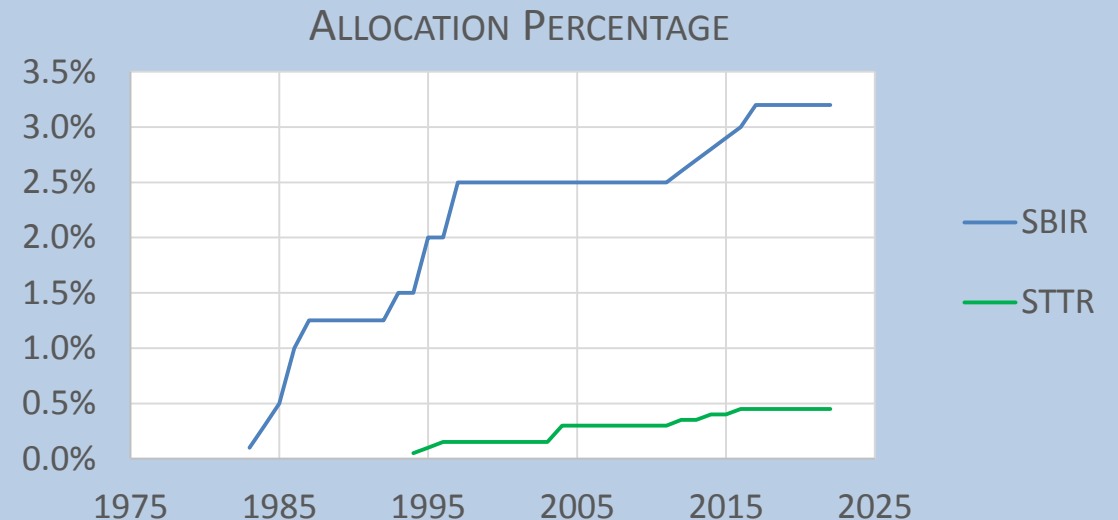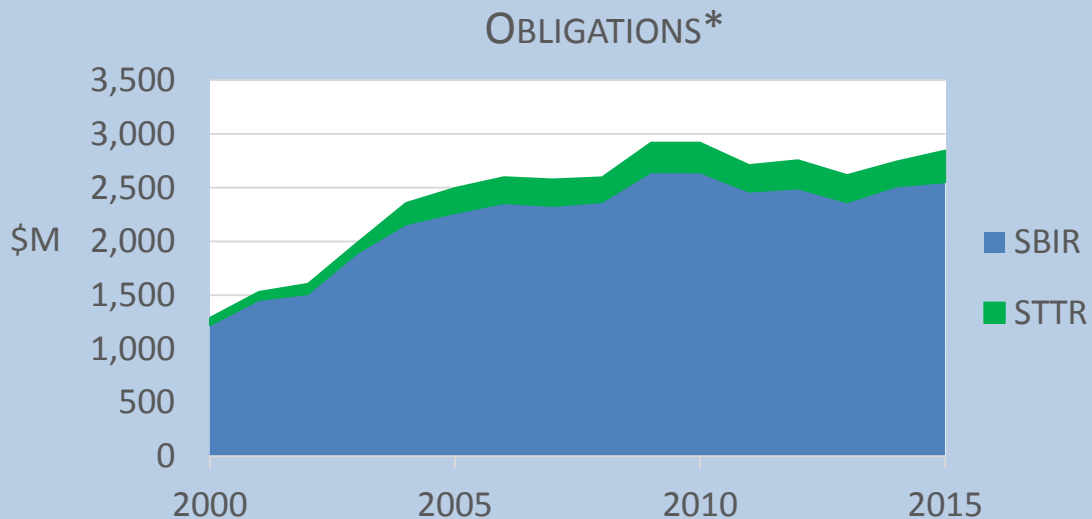
source: SBIR.gov, 8/22/2016

SBIR/STTR Budgets by Agency, FY2015
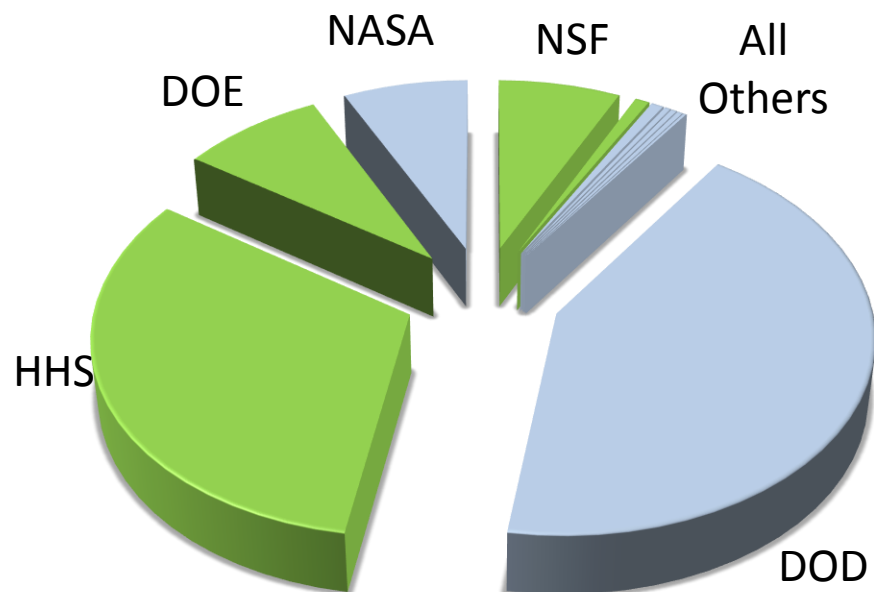
~ $2.5B in FY2015 across all agencies

Legend:
- Grants
- Contracts

Agencies with SBIR and STTR Programs	Budget
Department of Defense (DOD)	$ 1.070 B
Department of Health and Human Services (HHS), including the National Institutes of Health (NIH)*	$797.0 M
Department of Energy (DOE), including Advanced Research Projects Agency – Energy (ARPA-E)	$206.1M
National Aeronautics and Space Administration (NASA)	$ 180.1 M
National Science Foundation (NSF)	$176.0 M

Agencies with SBIR Programs	Budget
U.S. Department of Agriculture (USDA)	$20.3M
Department of Homeland Security (DHS): Science and Technology Directorate (S&T) and Domestic Nuclear Detection Office (DNDO)	$17.7 M
Department of Commerce: National Oceanic and Atmospheric Administration (NOAA) and National Institute of Standards and Technology (NIST)*	$8.4M
Department of Transportation (DOT)	$7.9 M
Department of Education (ED)	$7.5 M
Environmental Protection Agency (EPA)	$4.2 M

*NIH also issues contracts

3 Phases

PHASE I: FEASIBILITY, PROOF OF CONCEPT
- Award Amount: $150,000 (guideline), $225,000 (max.)
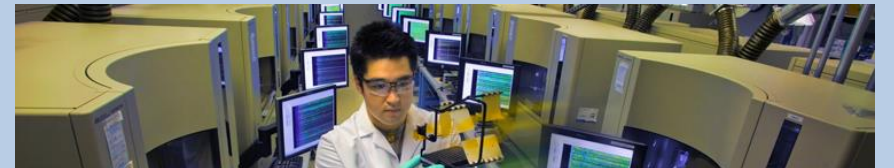- Project Duration: 6-12 months

PHASE II: CONTINUE R/R&D FOR PROTOTYPES OR PROCESSES
- Award Amount: $1,000,000 (guideline), $1,500,000 (max.)
- Project Duration: 2 years

PHASE III: COMMERCIALIZATION
- Federal or Private Funding (non-SBIR/STTR funds)
- No dollar or time limits

U.S. DEPARTMENT OF **ENERGY** | **SBIR/STTR Programs Office**

U. S. Department of Energy Mission

- **The mission of the Department of Energy** is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.

  - **Goal 1:** Catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in **energy** technologies.

  - **Goal 2:** Maintain a vibrant U.S. effort in **science and engineering** as a cornerstone of our economic prosperity, with clear leadership in strategic areas.

  - **Goal 3:** Enhance **nuclear security** through defense, nonproliferation, and environmental efforts.

Program Offices Participating in the DOE SBIR/STTR Programs

- Electricity Delivery & Energy Reliability
- Energy Efficiency & Renewable Energy
- Fossil Energy
- Nuclear Energy

- Advanced Scientific Computing Research
- Basic Energy Sciences
- Biological & Environmental Research
- Fusion Energy Sciences
- High Energy Physics
- Nuclear Physics

- Defense Nuclear Nonproliferation
- Environmental Management

U.S. DEPARTMENT OF ENERGY

SBIR/STTR Programs Office

8

Operation of the DOE SBIR and STTR Programs

DOE Program Office
- Develop Topics
- Identify Reviewers (Scientific Peer Review)
- Recommend Awardees
- Manage Projects

Technical Expertise Leveraged Throughout DOE

DOE Chicago Office
- Negotiate Grants
- Issue New and Continuation Awards
- Grant Closeout

Single Grants Office for Awardees

DOE SBIR/STTR Programs Office
- Develop Funding Opportunity Announcements
- Administer Review and Selection Process
- Ensure Compliance with SBIR/STTR Legislation
- Conduct Outreach

Single Administrative Office for Applicants

RECENT OPERATIONAL CHANGES

PHASE 0 PROGRAM

- MOTIVATION
  - Address one of the four programs goals for the SBIR/STTR programs:
    - *Foster and encourage participation socially and economically disadvantaged small businesses and women-owned small businesses in technological innovation*
  - Address National Academies assessment of the DOE SBIR/STTR Programs to improve participation by under-represented (UR) groups
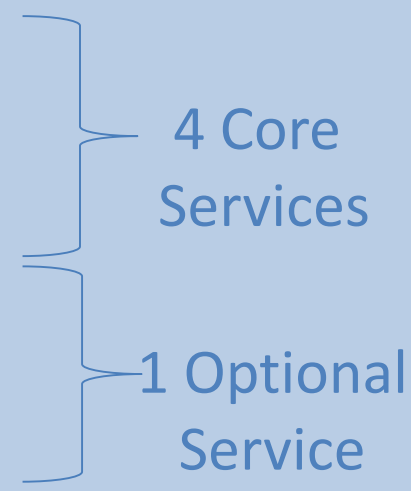- FUNDING AUTHORITY
  - Administrative Funding pilot (use of SBIR funds)
- GOAL
  - Increase the number of responsive, high quality proposals submitted to the DOE from:
    - Women-owned small businesses
    - Socially and economically disadvantaged small businesses (minority-owned)
    - Small businesses in states with historically low SBIR/STTR applications to the DOE

DOE Phase 0 Services

- Implemented in FY 2015

- Contractor-Provided Services: 4 core and 1 optional

  – Letter of Intent (LOI) writing assistance
  – Phase I proposal prep., review, & registration assistance
  – Small business development training & mentoring
  – Communication and market research assistance

  } 4 Core Services

  – Technology advice and consultation
  – Indirect rate and financial information
  – Travel Assistance
  – IP Consultation

  } 1 Optional Service

- Up to $5000 in support

Phase 0 Participation

- Participation in Phase 0 has grown as we have expanded outreach, but still remains a small fraction of the applicant pool

- Distribution of participants
  - There is significant overlap among the under-represented categories
  - Larger representation of small businesses from under-represented states compared with women-owned (WO) or minority-owned (MO)

	Phase I Applications from Phase 0 Participants	% of Total Applications
2015*	43	4%
2016	74	4%
2017	96	6%

*2015 data for second half of the year

UR State + WO + MO	4%
UR State + WO	8%
UR State + MO	8%
WO + MO	9%
UR State	43%
WO	14%
MO	15%
total	100%

UR State	62%
WO	35%
MO	36%

Phase 0 Award Rate

- Award Rates
  - UR groups are observed to have lower Phase I award rates compared with non-UR applicants
  - We have not yet generated data on an appropriate peer group for Phase 0 comparison: UR applicants with no previous DOE SBIR/STTR awards

Phase I Award Rates

U.S. DEPARTMENT OF **ENERGY** | **SBIR/STTR Programs Office**
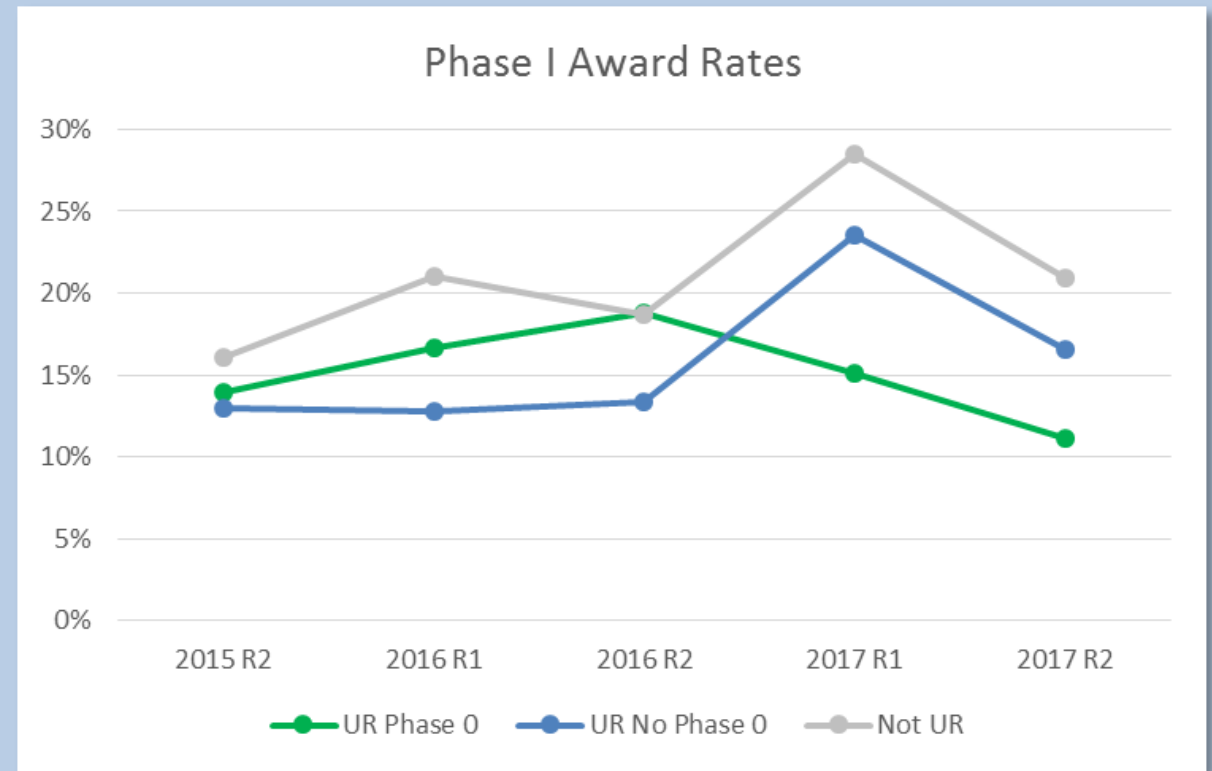
Applications from UR Groups

- Applications from UR Groups have increased during the period we provided Phase 0 services
  - Phase 0 outreach has helped to educate all applicants about WO and MO ownership designations in applications

Percent of Phase I Applications from UR Groups

U.S. DEPARTMENT OF **ENERGY**
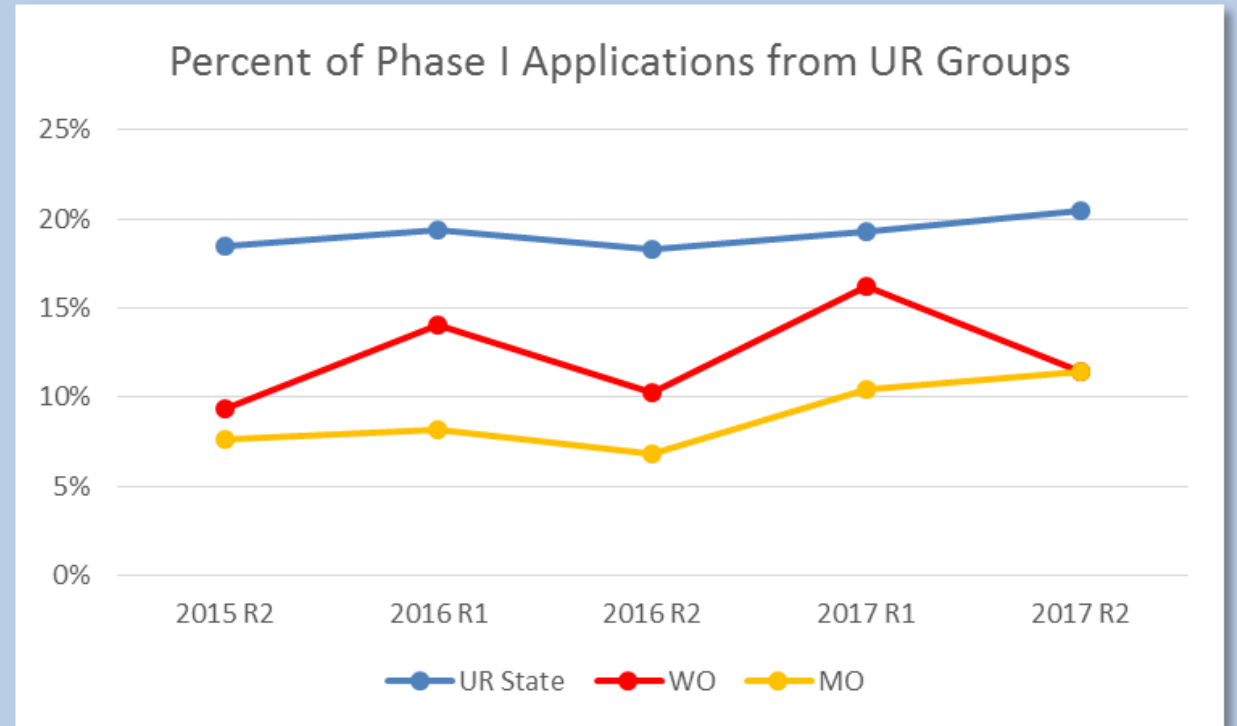
Awards to UR Groups

- Increased applications have not translated fully into increased awards across all UR groups
  - The gap is particularly pronounced for MO applicants

Percent of Phase I Awards to UR Groups
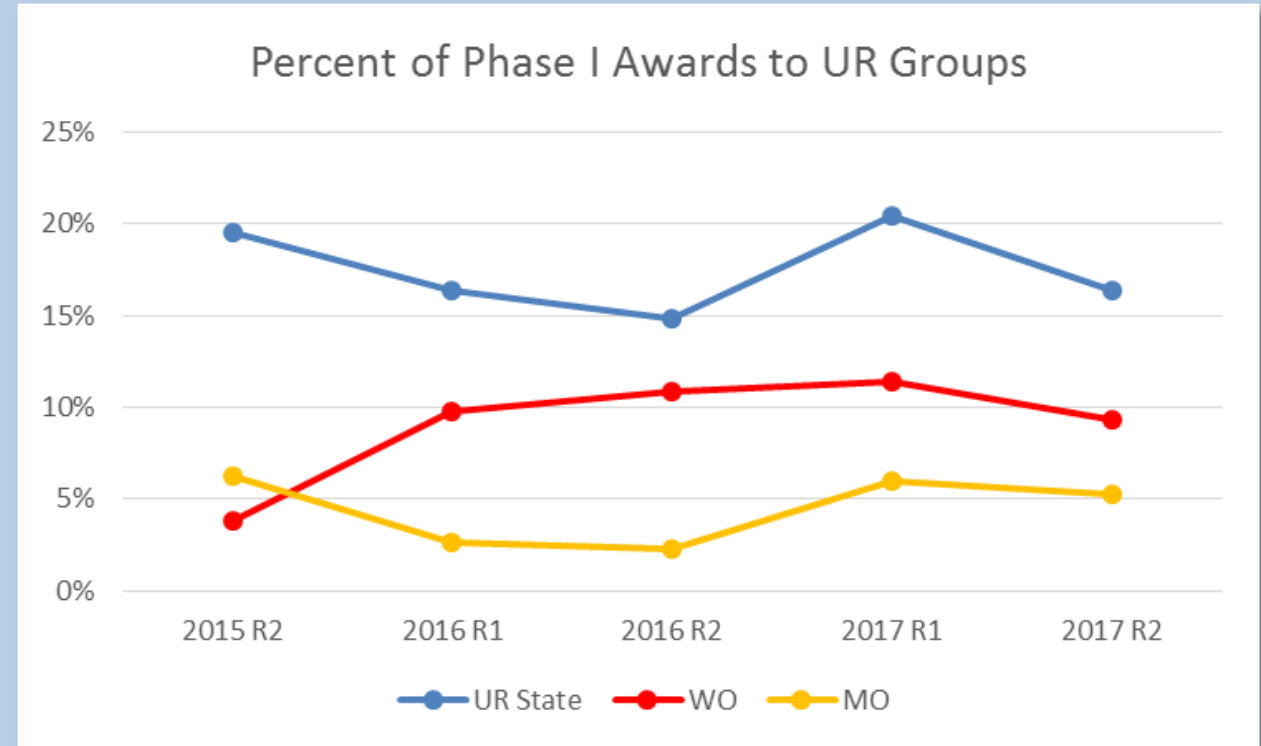
	UR State	WO	MO
Ratio of Award Rate to Application Rate (2015 R2 to 2017 R2)	0.92	0.74	0.50

Phase 0 Applicant Feedback

- Survey Feedback from participants (provided after application submission)
  - *We never would have completed the application without this assistance*
  - *Overall, I had very good experience, I thought I was very lucky that I could participate in such program, and I was happy with the mentor assigned to me.*
  - *Outstanding program!*
  - *This is a great program. Dawnbreaker gave us high level comments that were crucial in my opinion to crafting a great proposal!*
  - *We prepared a very solid package of proposal content, with Dawnbreaker's good help.*
  - *The good thing was that you keep us on time and were available for questions almost any time.*
  - *I thought it was really great that DOE sponsors such program.*
  - *I was guided very efficiently through SBIR application process, and received valuable feedback and advice.*
  - *As a new company, it was great that I could learn all details of application. Furthermore, market research was extremely useful, as well as help with budget planning.*
  - *It is a great program for small businesses.*

Initial Phase 0 Assessment

- Participation
  - Increased recruitment activities are needed to attract women-owned and minority-owned applicants

- Application Quality
  - Data and participant feedback indicate that Phase 0 assistance is helping first-time, UR applicants successfully compete for Phase I grants
  - More work is needed to compare the Phase 0 group with a comparable peer group
  - Phase 0 Assistance has helped to educate all applicants about WO and MO designations

- Continuation
  - The SBIR administrative funding pilot (expires September 30, 2017) is essential for providing both Phase 0 services and outreach to under-represented groups (e.g. SBIR Road Tour)

STREAMLINING THE APPLICATION AND AWARD PROCESS

- Increased time to prepare innovative applications; reduced time from application to start date of grant

	topics released	applications due	start date of grant
FY 2011	1.5 months	8 months	
FY 2013	3 months	4.5 months	
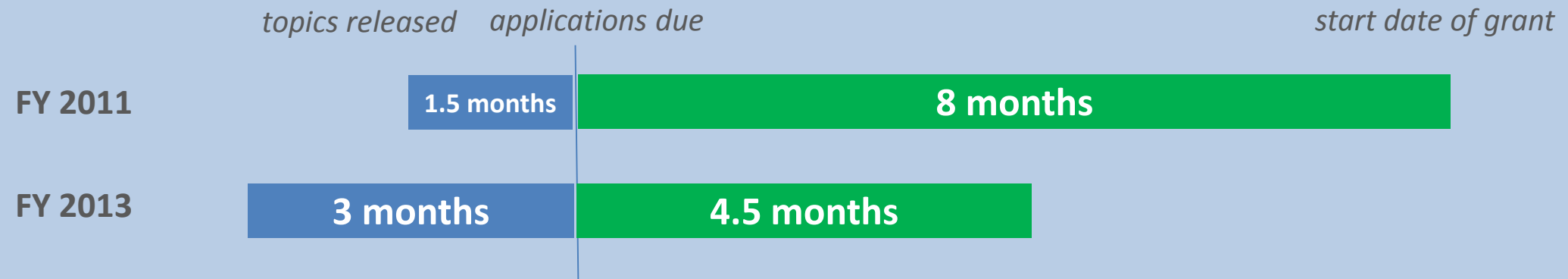
Key Enablers for Streamlining

- Technology
  - web-based application management system

- Management practices
  - two Phase I and two Phase II solicitations annually to distribute workload
  - letters of intent

- Effective communications
  - online webinars and tutorials
  - email list (>15,000) and twitter (>1900 followers)

Letters of Intent

- Primary Objective: Identify reviewers prior to receipt of applications
- Secondary Benefit: By providing feedback for non-responsive applications, we are able to reduce the number of non-responsive applications

DOE Phase I

letters of intent — applications — applications recommended for funding — awards

U.S. DEPARTMENT OF ENERGY | **SBIR/STTR Programs Office**
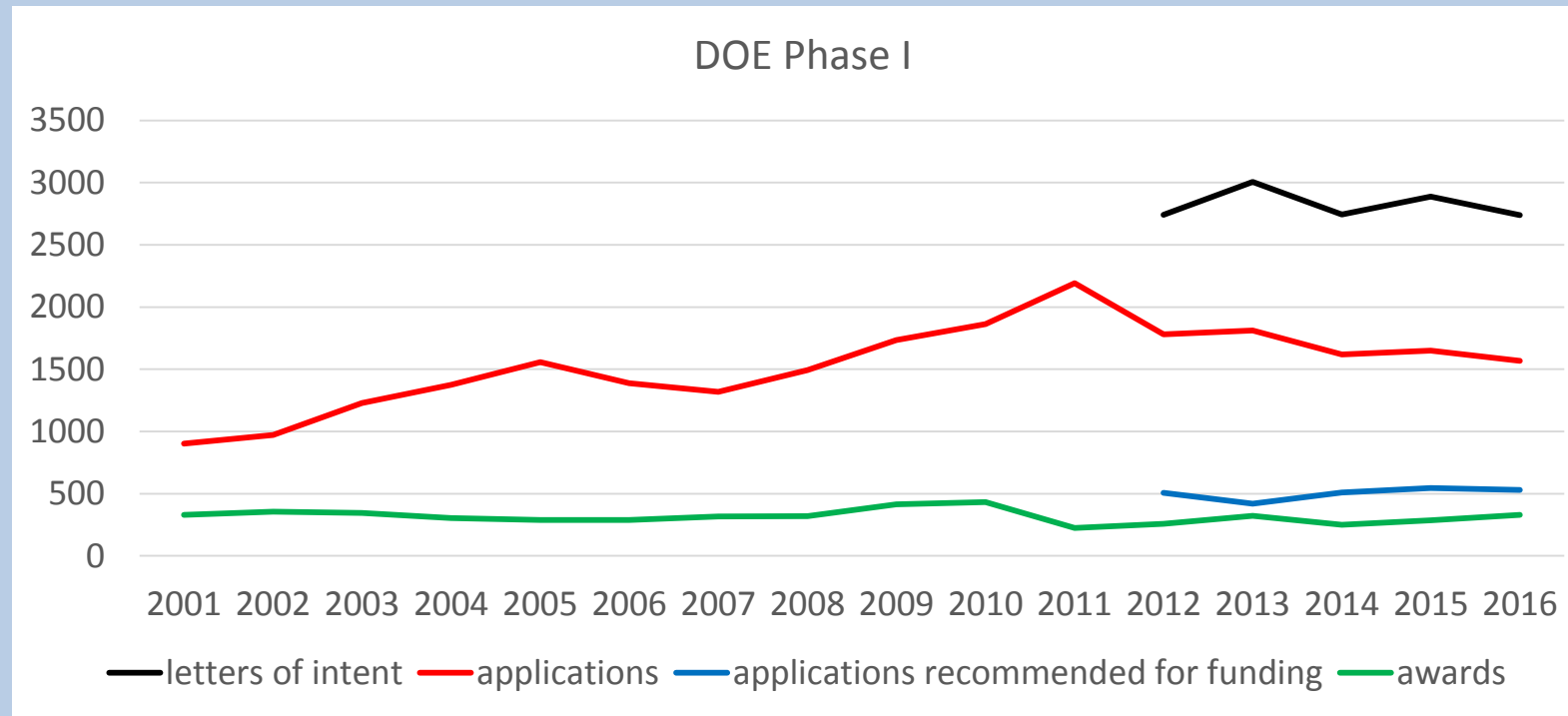
Sequential Phase II Awards

| PHASE I 6-12 months | PHASE II up to 24 months | SEQUENTIAL PHASE II up to 24 months |

- Sequential Phase II awards implemented in FY 2014
  - Phase IIA
  - Phase IIB
- Authorized by 2012 SBIR/STTR Reauthorization
- Maximum Award Amount: $1,000,000

Phase IIA

- Some prototype or process R&D efforts require more time and funding than available with a single Phase II award

- Historically such projects required small businesses to complete two or more Phase I/II cycles to complete their R&D

- Phase IIA awards will start immediately upon completion of the Phase II award

U.S. DEPARTMENT OF **ENERGY**

Phase IIA Timeline

No gap between end of Phase II and start of Phase IIA

Phase I	Phase II	Phase IIA
6-12 months	*2 years*	*up to 2 years*

Phase IIA application submitted in advance of completing Phase II award
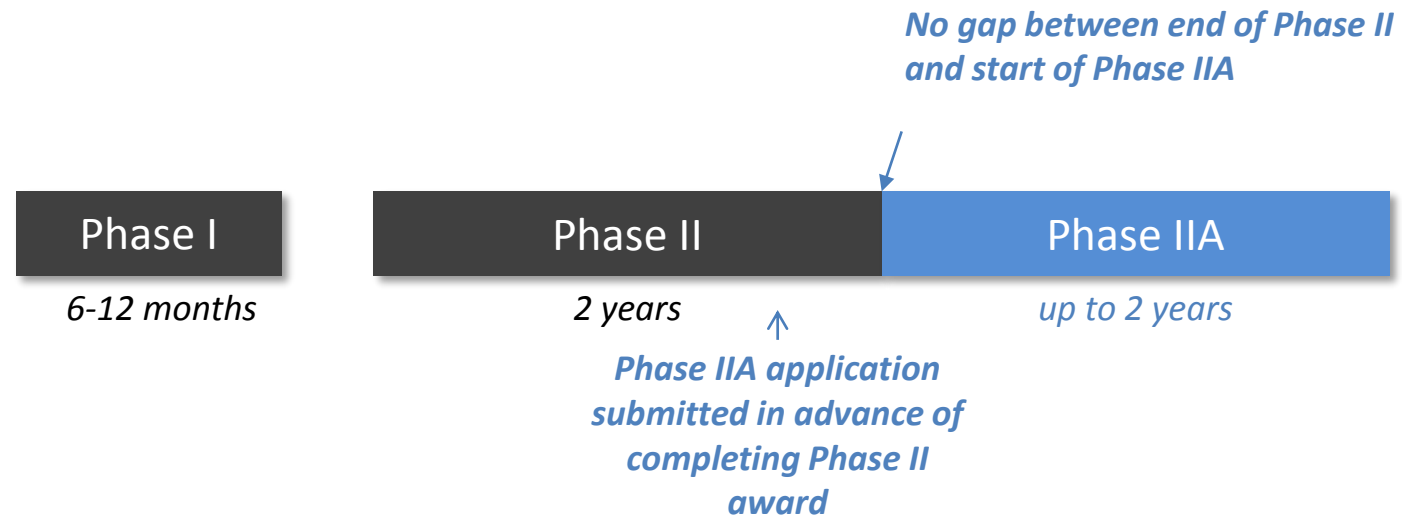
Phase IIB

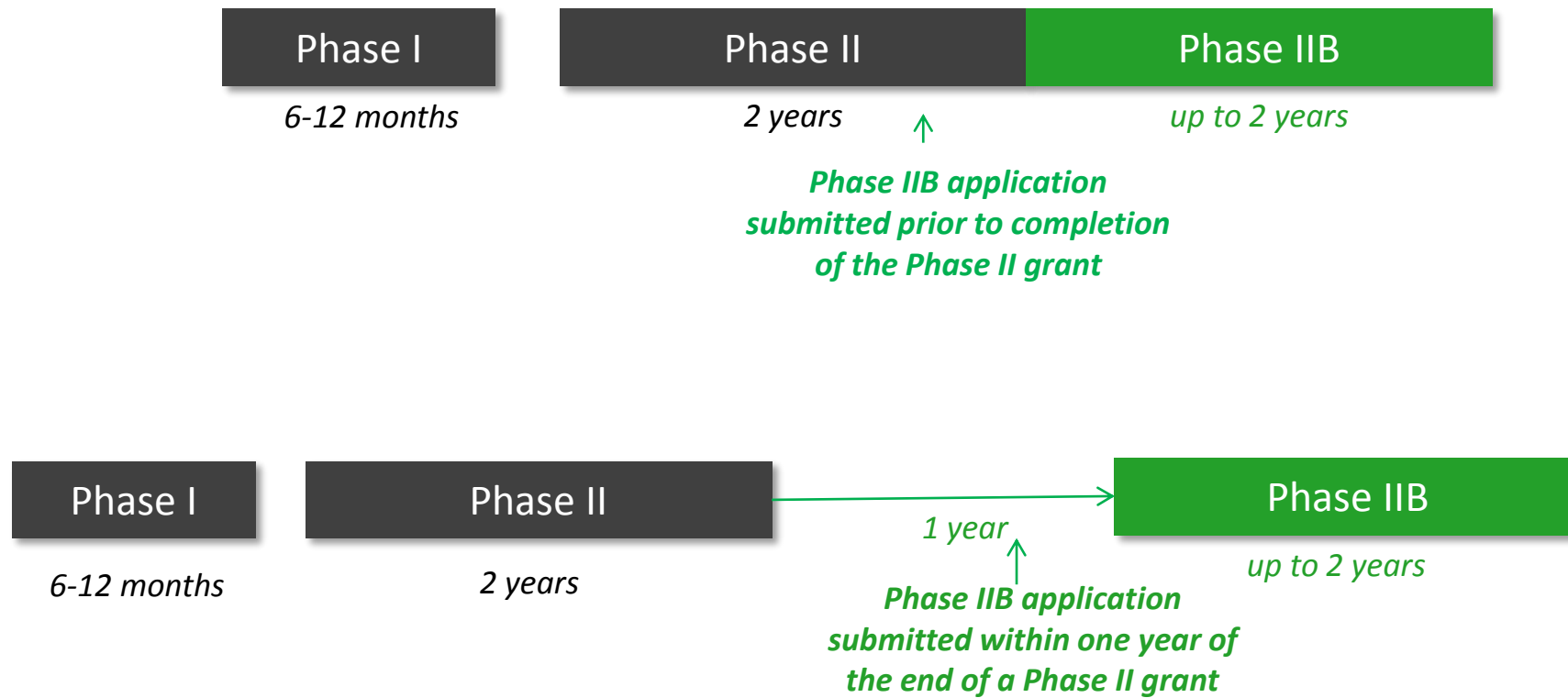- After successfully completing Phase II R&D, some projects may require R&D funding to transition an innovation towards commercialization

- DOE is utilizing Phase IIB to increase the number of positive commercialization outcomes resulting from Phase II awards

- Phase IIB awards will start immediately after completing a Phase II or up to 1 year later

Phase IIB Timeline: Two Options

Phase I	Phase II	Phase IIB
6-12 months	*2 years*	*up to 2 years*

Phase IIB application submitted prior to completion of the Phase II grant

Phase I	Phase II		Phase IIB
6-12 months	*2 years*	*1 year*	*up to 2 years*

Phase IIB application submitted within one year of the end of a Phase II grant

Sequential Phase II Awards

- Sequential Phase II awards account for less than 15% of DOE's Phase II awards

- Overall, applications and awards for Phase IIA are slowly trending upward

- Applications for Phase IIB trending downward with award levels remaining flat

Sequential Phase II

Legend: ■ Phase IIA Applications ■ Phase IIA Awards ■ Phase IIB Applications ■ Phase IIB Awards
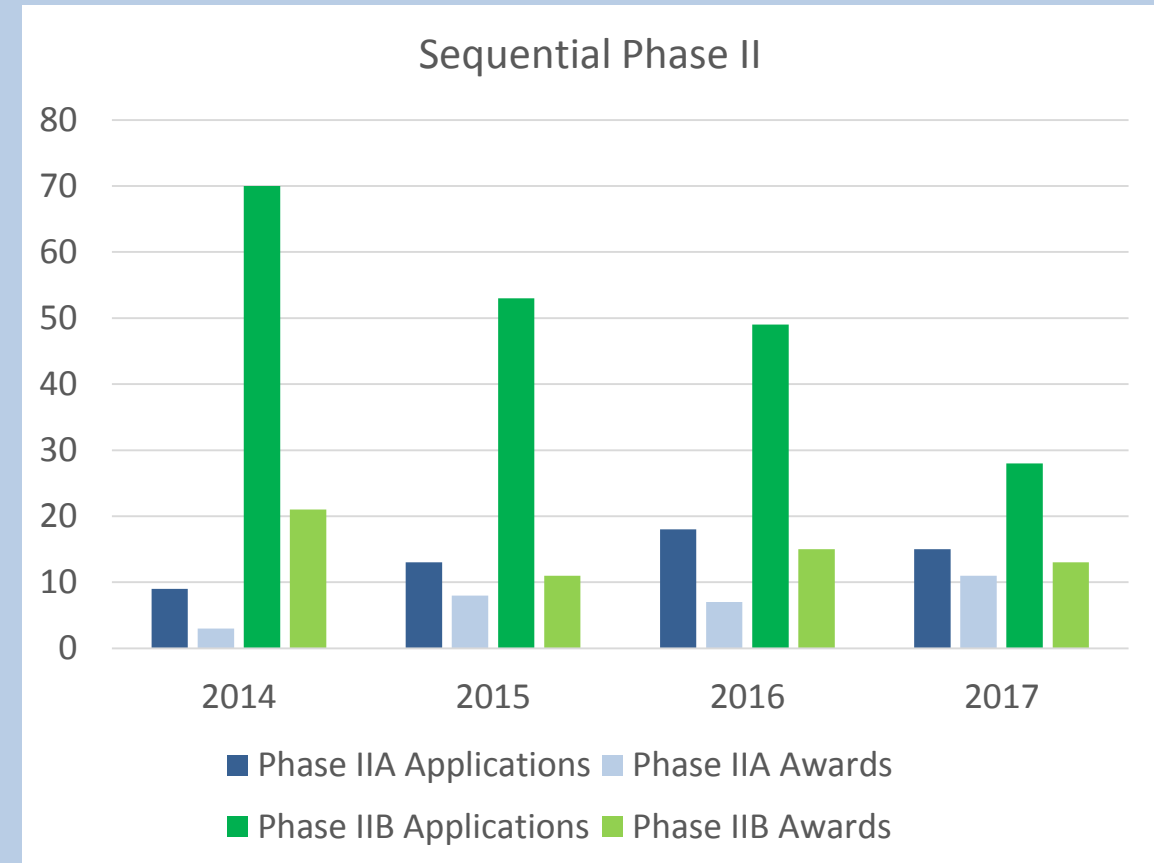
# ASCR SBIR/STTR Research Topic Innovations

- Collaborative Research Topics
  - Multiple companies collaborate on a single SBIR/STTR project, but receive independent SBIR/STTR awards
    - Enables DOE to address technical challenges that require broad expertise
    - Each company submits the same collaborative proposal, but with a budget that reflects its share of the R&D
    - Collaborating companies must have an IP agreement in place prior to award
- Multi-program Topics
  - Multiple DOE programs collaborate to issue a joint topic
  - Example: FY 2018 Phase I Release 1
    - 1. BIGDATA TECHNOLOGIES FOR SCIENCE, ENGINEERING, AND MANUFACTURING (ASCR, BES, BER)

ASSESSMENT OF THE DOE SBIR/STTR PROGRAMS

ASSESSMENT OF THE DOE SBIR/STTR PROGRAMS

- 2016 Study
  - Assessment performed by the National Academies of Sciences, Engineering and Medicine
  - Report issued December 2016: https://www.nap.edu/catalog/23406/sbirsttr-at-the-department-of-energy

- Next study
  - Task order for next study issued July 2017
  - Report due to Congress December 31, 2019
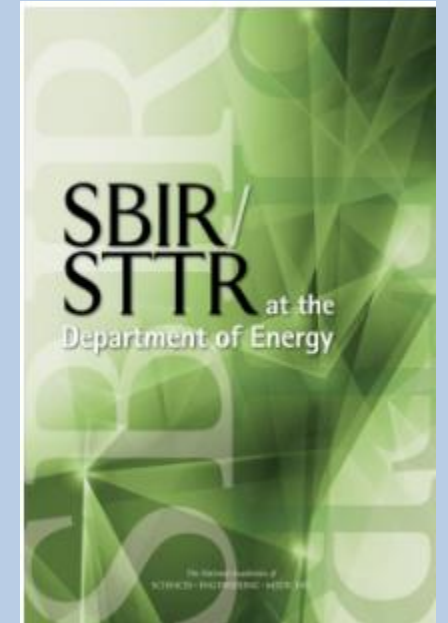
Overall Findings

- The SBIR program at the DoE is having a positive overall impact. It is meeting three of the four legislative objectives of the program with regard to

  - stimulating technological innovation,

  - using small businesses to meet federal research and development (R&D) needs, and

  - increasing private-sector commercialization of innovations derived from federal R&D.

- However, the committee finds that more needs to be done to

  - foster and encourage participation by socially and economically disadvantaged small businesses (SDBs), and by woman-owned small businesses (WOSBs), in technological innovation.

- The STTR program at DoE is also meeting the program's statutory objectives, defined above, in that it is encouraging and supporting linkages between small business concerns(SBCs) and research institutions (RIs).

Key Findings: Program Management

- **DoE has substantially improved its SBIR/STTR programs since 2008** (the publication year of the previous National Academies report on the DoE SBIR program). A number of recommendations from the 2008 report have been adopted. (Finding I-A)

- DoE has adopted a number of other initiatives and pilot programs, which collectively have improved the program. (Finding I-A)

- DoE is seeking ways to improve its data collection and tracking. (Finding I-E)

Key Findings: Commercialization

- **Nearly half of the respondents to the National Academies' 2014 Survey reported some sales, and a further 23 percent reported anticipating future sales**. Of those respondents reporting some sales, 25 percent had sales less than $100,000. Six percent had sales over $10 million, and an additional 26 percent had sales over $1 million. The large number of companies with small-scale revenues suggests that although many companies reach the market, few can be described as successful in commercial terms. This finding reflects a deeper understanding of the limitations of the available data on successful commercialization. (Finding II-A)

- Subsequent investment in DoE SBIR/STTR projects is an indicator that they are seen as having the potential for commercial value even if they have not yet reached the market. The 2014 Survey shows that **seventy-eight percent of 2014 Survey respondents reported receiving additional investment funding in the technology related to the surveyed project**. (Finding II-C)

- SBIR/STTR funding makes a substantial difference in determining project limitation, scope, and timing. The 2014 Survey data show that **seventy-one percent of respondents reported that the project probably or definitely would not have proceeded without SBIR/STTR funding**. (Finding II-E)

Key Findings: Fostering the Participation of Women and Other Underserved Groups in the SBIR/STTR Programs

- Current data show that **the objective of fostering the participation of women and underserved minorities has not been met by the DoE SBIR/STTR programs**. (Finding III-A)

- **Woman-owned firms accounted for less than 9 percent of Phase I SBIR and STTR awards in FY 2005-2015**. The average success rates for Phase I applications by firms owned by woman and white males were 15.7 percent and 18.9 percent, respectively, during this period. (Finding III-A)

- **Minority-owned firms accounted for less than 7 percent of Phase I SBIR and STTR awards during FY 2005-2015**. (Finding III-A)

- Among respondents to the 2014 Survey, the vast majority of "minority" firms were in fact owned by Asians. Firms owned by Blacks, Hispanics, and American Indians accounted for 2 percent of all responses (including zero Black-owned and American-Indian owned firms). (Finding III-A)

- DoE is making efforts to understand the patterns of woman and minority participation in the SBIR program, but more is needed. (Finding III-C)

U.S. DEPARTMENT OF ENERGY

SBIR/STTR Programs Office

Key Findings: Stimulating Technological Innovation and Meeting Agency Mission Needs

- The **DoE SBIR/STTR programs support the development and adoption of technological innovations that advance the agency's mission**. (Finding IV-A)

- The **DoE SBIR/STTR programs connect companies to universities and research institutions**. Among SBIR awardees responding to the 2014 Survey, 43 percent reported a link to a research institution related to the surveyed project; 26 percent reported that faculty worked on the project (not as a PI); 21 percent employed graduate students for the project; and 29 percent used universities and research institutions as subcontractors for the surveyed project. (Finding IV-B)

Key Findings: Fostering Innovative Companies

- The DoE SBIR/STTR programs encourage new firm start-up. **Forty-five percent of companies responding to the 2014 Survey indicated that the company was founded entirely or in part because of the SBIR/STTR programs**. (Finding V-A)

- **Sixty-one percent of respondents to the 2014 Survey indicated that the DoE SBIR/STTR programs "had a highly positive or transformative effect" on their company**. Another 35 percent said that it "had a positive effect." (Finding V-C)

Key Findings: STTR

- **STTR is meeting the program objectives** defined in the Small Business Administration's Policy Guidance for STTR. (Finding VI-A)

- Analysis of STTR in particular suggests that **National Laboratories generally do not make good formal partners for small business concerns**: their administrators do not prioritize SBIR/STTR because the funding amounts are small; and small businesses have limited leverage if the Laboratories fail to meet their obligations. (Finding VI-E)

- The **DoE SBIR and STTR programs have not made sufficient efforts to enhance collaborations between the National Laboratories and small innovative firms**. (Finding VI-E)

Recommendations

- 21 recommendations were made in five areas
  - I. Improving Monitoring, Evaluation, and Assessment
  - II. Addressing Underserved Populations
  - III. Improving Commercialization Outcomes
  - IV. Improving Linkages to National Laboratories
  - V. Improving Program Management
- The SBIR/STTR Programs Office is working to address these recommendations